AN EXPERIMENTAL INVESTIGATION OF THE THERMAL CONDUCTIVITY OF TOLUENE BY HIGH PRESSURES

V. V. Pugach

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This paper gives the results of an experimental investigation of the thermal conductivity of toluene at temperatures 20-180°C and pressures up to 150 MN/m^2. The thermal conductivity of toluene was measured on a specially constructed apparatus in which the measuring cell was of the coaxial-cylinder type [1]. The toluene selected for investigation was "scintillator toluene" ($\rho_4^{20} = 0.8669$; $n_D^{20} = 1.4969$). The measurements were made on the isotherms at intervals of ~ 20-30 MN/m^2. The maximum relative error of measurement was estimated as 1.6% when the scatter of the experimental points relative to the averaging curves was not more than 0.6%. The experimental data are tabulated; it is found that the thermal conductivity of toluene decreases with increase in temperature and increases with increase in pressure. The isobars are slightly bent towards the temperature axis, and the isotherms bend away from the pressure axis. The experimental data are compared with the data of [2-6] at atmospheric pressure and with [7-8] by using the temperature dependence of $(\partial\lambda/\partial p)_t^{c_p}$. The experimental data are represented satisfactorily by an interpretation equation of the form

$$\lambda_{p,t} = \lambda_{p,20} - \left(\frac{\partial\lambda}{\partial t}\right)_p^{c_p} \cdot (t - 20),$$

where

$$\lambda_{p,20} = \lambda_{20} + 0.0451 \ln\left(1 + \frac{p}{107.45}\right),$$

$$\left(\frac{\partial\lambda}{\partial t}\right)_p^{c_p} = (0.230 - 0.000591\, p) \cdot 10^{-3}.$$

The differences between the experimental and calculated data do not exceed the experimental error.

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